

**U.S. Department of Energy
Washington, D.C.**

ORDER

DOE O 452.1A

Issue Date: 1-17-97
Review Date: 1-17-99

SUBJECT: NUCLEAR EXPLOSIVE AND WEAPON SURETY PROGRAM

1. **OBJECTIVES.**

- a. To establish requirements and responsibilities for the Department of Energy's (DOE's) Nuclear Explosive and Weapon Surety (NEWS) Program.
- b. To maintain a formal, comprehensive, and systematic DOE NEWS Program to protect the public and worker health and safety and the environment while supporting national defense requirements.
- c. To establish nuclear explosive surety standards, nuclear weapon design surety requirements, and appraisal requirements for the DOE NEWS Program.
- d. To establish specific requirements for related elements of the DOE NEWS Program as provided in the 452- and 5610-series Orders identified in paragraph 4a. Responses to unplanned events (e.g., Accident Response Group activities) are addressed in the 5530-series Orders and DOE O 151.1, COMPREHENSIVE EMERGENCY MANAGEMENT SYSTEM, dated 9-25-95.

2. **CANCELLATION.** DOE O 452.1, NUCLEAR EXPLOSIVE AND WEAPON SURETY PROGRAM, dated 04-29-96 is canceled. Cancellation of the above Order does not, by itself, modify or otherwise affect any contractual obligation to comply with the Order. Canceled Orders that are incorporated by reference in a contract shall remain in effect until the contract is modified to delete the reference to the requirements in the canceled Orders.

3. **APPLICABILITY.**

- a. **DOE Elements.** This Order applies to DOE Headquarters and field elements involved in the DOE NEWS Program.
- b. **Contractors.** This Order applies to all contractors and subcontractors that manage, oversee, or conduct the DOE NEWS Program as provided by law and/or by contract as implemented by the appropriate contracting officer. Responsibilities

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are delineated for contractors and Federal employees with the Orders, referenced Rule, Technical Standards, and Implementation Guide. Responsibilities are in sufficient detail such that an additional document, such as a Contractor Requirement Document, would not be beneficial and may hamper implementation.

- c. Exclusions. None.

4. REQUIREMENTS.

- a. Nuclear Explosive and Weapon Surety Orders. The DOE NEWS Program shall be governed by this Order, relevant Orders from the DOE Safeguards and Security Program (470- and 5630-series Orders), and the following DOE Orders.

- (1) DOE O 452.2A, SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS, dated 1-17-97, which establishes DOE requirements and responsibilities for ensuring the safe conduct of DOE nuclear explosive operations. It addresses both nuclear explosive safety (NES) and environment, safety, and health (ES&H).
- (2) DOE 5610.12, PACKAGING AND OFFSITE TRANSPORTATION OF NUCLEAR COMPONENTS, AND SPECIAL ASSEMBLIES ASSOCIATED WITH THE NUCLEAR EXPLOSIVES, dated 7-26-94, which establishes policy, objectives, responsibilities and authorities, and requirements for the safe packaging and offsite transportation of nuclear components and special assemblies associated with the nuclear weapon program requiring the use of the Transportation Safeguards System (TSS).
- (3) DOE 5610.13, JOINT DEPARTMENT OF ENERGY/DEPARTMENT OF DEFENSE NUCLEAR WEAPON SYSTEM SAFETY, SECURITY, AND CONTROL ACTIVITIES, dated 10-10-90, which establishes DOE policy, responsibilities and authorities, and requirements for addressing joint nuclear weapon and nuclear weapon system safety issues in conjunction with the Department of Defense (DoD). It covers DOE participation in DoD Nuclear Weapon System Safety Groups, which conduct safety studies of nuclear weapon systems operated by the DoD and develop weapon system safety rules governing those operations.
- (4) DOE 5610.14, TRANSPORTATION SAFEGUARDS SYSTEM PROGRAM OPERATIONS, dated 5-12-93, which establishes DOE policy, authorities and responsibilities, and requirements for the management and operation of the TSS Program which includes transportation of nuclear explosives.

- b. Integrated Safety Management. The requirements in this Order may be implemented using a DOE-approved integrated safety management approach as described in DOE Policy P 450.4, SAFETY MANAGEMENT SYSTEM POLICY, dated 10-15-96. A "graded approach" to the requirements in this Order is not permitted unless in the context of an approved integrated safety management program.
- c. Nuclear Explosive Surety Standards. All DOE nuclear explosive operations shall meet the following qualitative surety standards to prevent unintended nuclear detonation, fissile material dispersal from the pit, or loss of control. There shall be positive measures to:
 - (1) minimize the possibility of accidents, inadvertent acts, or authorized activities that could lead to fire, high-explosive deflagration, or unintended high-explosive detonation;
 - (2) minimize the possibility of fire, high-explosive deflagration, or high-explosive detonation, given accidents or inadvertent acts;
 - (3) minimize the possibility of deliberate unauthorized acts that could lead to high-explosive deflagration or high-explosive detonation;
 - (4) ensure adequate security of nuclear explosives; and
 - (5) minimize the possibility of or delay unauthorized nuclear detonation.
- d. Nuclear Explosive Safety. Safety Standards, paragraphs 4c(1), (2), and (3), above, shall be met for all nuclear explosive operations conducted by the Department and/or its contractors to ensure adequate nuclear explosive safety. The adequacy of positive measures to meet these standards shall be evaluated by the Nuclear Explosive Safety Study Group (NESSG). Additional requirements are specified in DOE O 452.2A, SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS, dated 1-17-97.
- e. Nuclear Explosive Security. The Security Standard, paragraph 4c(4), above, shall be met to ensure adequate nuclear explosive security for all nuclear explosive operations conducted by the Department and/or its contractors. Nuclear explosives shall be secured in accordance with the requirements in the 5630-series Orders. These safeguards and security measures shall be documented in the Site Safeguards and Security Plan. The adequacy of these safeguards and security measures shall be assessed and documented in Operations Office site security surveys and Office of Security Evaluations (EH-21) inspections and evaluations. The NESSG shall include security operations in its evaluation for potential adverse impact on nuclear explosive safety.

- f. Nuclear Explosive Use Control. Use Control Standards, paragraphs 4c(3) and (5), above, shall be met for all nuclear explosive operations conducted by the Department and/or its contractors. Use control measures shall be evaluated by the NESSG for potential adverse impact on nuclear explosive safety. The Operations Office manager shall implement the use control policy as described in the Atomic Energy Act of 1954, as amended, Executive Order 2, National Security Decision Directives 281 and 309, "An Agreement Between the AEC and the DoD for the Development, Production, and Standardization of Atomic Weapons," and "Memorandum of Understanding Between the DoD and the DOE on Objectives and Responsibilities for Joint Nuclear Weapon Activities," and evaluate the effectiveness of use control measures.
- g. Nuclear Test Detonation Safety. There shall be positive measures to minimize the possibility for the initiation of the nuclear explosive test device detonator(s) until detonation is authorized.
- h. Nuclear Weapon Design Surety.
- (1) Surety shall be an integral part of design and development of new weapons and the modification of existing weapons. Explicit consideration of surety shall begin at the concept definition phase and continue throughout development and engineering.
 - (2) New nuclear weapon designs shall incorporate current surety features unless there are overriding reasons for not doing so and explicitly documented agreements to this effect are reached between the Secretaries of Energy and Defense. The following shall be implemented in the design of new nuclear weapons.
 - (a) Nuclear Detonation Safety. Nuclear weapons shall incorporate design features that minimize the possibility of accidental and/or inadvertent nuclear detonation. The following are design goals for nuclear weapons delivered to the DoD.
 - 1 Normal Environment. Prior to receipt of the enabling stimuli and the arming signal, the probability of a premature nuclear detonation shall not exceed one in a billion (1E-09) per nuclear weapon lifetime.
 - 2 Abnormal Environment. Prior to receipt of the enabling stimuli, the probability of a premature nuclear detonation shall not exceed one in a million (1E-06) per credible nuclear weapon accident or exposure to abnormal environments.

- 3 One-Point Safety. The probability of achieving a nuclear yield greater than four pounds of trinitrotoluene (TNT) equivalent in the event of a one-point initiation of the weapon's high explosive shall not exceed one in a million (1E-06).
 - 4 Multi-Point Safety. Multi-point initiation in abnormal environments shall be evaluated as part of the design process.
- (b) Fissile Material Dispersal Safety. Design features for reducing the possibility of fissile material dispersal from the pit under credible abnormal environments shall be incorporated for each new nuclear weapon unless the responsible military service requests and properly justifies an exception.
 - (c) Use Control. Use control features shall include design features that allow timely authorized use of a nuclear weapon while precluding or delaying unauthorized use.
 - (d) Inadvertent Criticality. The criticality safety of a nuclear weapon shall be evaluated by the design agency to document the intrinsic safety of the design in both normal and abnormal environments.
- i. Nuclear Weapons Surveillance Program. The surveillance program contributes to assessing the surety of weapons and components in the stockpile. The DOE stockpile surveillance program involves routine periodic examination, evaluation, and testing of stockpile weapons and weapon components to ensure that they conform to performance specifications. It also identifies and evaluates the effect of unexpected or age-related changes. While primarily a reliability program, the stockpile surveillance program may identify safety related issues of special concern to the DOE NEWS Program. The knowledge gained shall be used as appropriate to improve nuclear weapon surety.
 - j. Authorization for a Nuclear Explosive Operation.
 - (1) Before a nuclear explosive operation can begin, the following documentation shall be completed and approved.
 - (a) Facility Safety Analysis Report, approved by EH-1.
 - (b) Operation Hazard Analysis Report, approved by the responsible Operations Office manager.

- (c) Any required Technical Safety Requirements, approved by EH-1; Operational Safety Controls, approved by the responsible Operations Office manager; or Nuclear Explosive Safety Rules, approved by DP-20.
 - (d) Nuclear explosive operation readiness review, approved by the responsible Operations Office manager.
 - (e) Required facility readiness reviews, approved by the responsible Operations Office manager.
 - (f) Nuclear Explosive Safety Study Report, approved by DP-20.
 - (g) Certification that all nuclear explosive surety standards are met by the responsible Operations Office manager.
- (2) Operations Office managers may issue letters authorizing nuclear explosive operations. This authorization must document either the satisfactory completion of each of the seven approvals identified in paragraph 4j(1). Nuclear explosive operations may be undertaken only when all such conditions are met.
- k. Appraisals. Organizations that have DOE NEWS Program responsibilities shall be periodically appraised as follows.
- (1) The Assistant Secretary for Defense Programs (DP-1) shall schedule and conduct appraisals of DOE Headquarters.
 - (2) The Deputy Assistant Secretary for Military Application and Stockpile Management (DP-20) shall schedule and conduct appraisals of the Operations Offices.
 - (3) Operations Offices shall schedule and conduct appraisals of the Area Offices, laboratories, and contractors to determine compliance with requirements in the 452- and 5610-series Orders and associated field directives. Appraisals shall be conducted in accordance with a schedule promulgated by the cognizant Operations Office manager and approved by DP-20. The Albuquerque Operations Office shall appraise the Transportation Safeguards Division. The appraisal team may include Headquarters observer(s).
 - (4) Operations Office appraisals of the safety of nuclear explosive operations and associated activities and facilities (DOE O 452.2A) shall include both nuclear explosive surety and ES&H elements, although not necessarily in the same appraisal. The field organizations' responsibilities in DOE G

414.1-1, IMPLEMENTATION GUIDE FOR USE WITH THE INDEPENDENT AND MANAGEMENT ASSESSMENT REQUIREMENTS OF DOE 5700.6C AND 10 CFR PART 830.120 QUALITY ASSURANCE, dated 10-11-96, and the requirements of DOE 5700.6C, QUALITY ASSURANCE, dated 8-21-91, shall apply to ES&H appraisals with the following modifications.

- (a) NES concerns, as described in DOE O 452.2A, shall be integrated into the process used to assess the adequacy of the implementation of ES&H requirements.
 - (b) NES personnel shall evaluate all corrective action plans on nuclear explosive operations and associated activities and facilities to ensure that proposed actions do not adversely affect nuclear explosive safety.
- (5) Nuclear explosive surety appraisals shall evaluate compliance with applicable directives and requirements and assess the overall effectiveness of the DOE NEWS Program. Nuclear explosive surety appraisals shall be planned and conducted in accordance with ASME NQA-1-1994, Quality Assurance Requirements for Nuclear Facility Applications, "Basic Requirement 18, Audits," and "Supplement 18S-1, Supplementary Requirements for Audits." Additional guidance is provided in ASME NQA-1 Appendix 18A-1, "Nonmandatory Guidance on Audits."
- (6) The organization responsible for conducting appraisals shall develop a training and qualification program for appraisal personnel.
- 1. Implementation Requirements. Within 12 months after this Order is issued, Operations Offices shall develop an implementation plan to describe how the requirements of this Order will be implemented. The implementation plan shall be submitted to DP-20 for approval and shall include the following.
 - (1) Identify the programs, plans, practices, procedures, and other actions to be used in complying with the requirements.
 - (2) Establish a schedule for actions necessary to achieve compliance.
 - (3) Identify needed resources.
 - (4) Identify those compensatory measures deemed necessary to provide for adequate protection during the period of noncompliance.

5. RESPONSIBILITIES.a. Secretary of Energy (S-1).

- (1) Is responsible for the surety of all nuclear explosive operations conducted by the Department and/or its contractors.
- (2) Exercises dual-agency responsibility with DoD for the surety of nuclear weapons in DoD custody.
- (3) Designates the DOE member to the Nuclear Weapons Council.

b. Assistant Secretary for Defense Programs (DP-1).

- (1) Implements DOE policy for the DOE NEWS Program, including those aspects of the program related to public and worker health and safety and protection of the environment.
- (2) Reviews and concurs or does not concur on DoD-proposed nuclear weapon system safety rules.
- (3) Coordinates with the Assistant Secretary for Environment, Safety and Health (EH-1) to ensure that appropriate ES&H requirements are integrated with NEWS requirements and that divergence does not occur.
- (4) Conducts appraisals of the DOE Headquarters Weapon Surety Program to evaluate management of the DOE NEWS Program.

c. Assistant Secretary for Environment, Safety and Health (EH-1).

- (1) Provides assistance to DP-1 for ES&H disciplines.
- (2) Coordinates with DP-1 on ES&H requirements to ensure that divergence between ES&H and DOE NEWS programs does not occur.
- (3) Provides safeguards and security inspection reports related to the DOE NEWS Program through the Office of Security Evaluations (EH-21) to DP-20, Office of Security Affairs, and the cognizant Operations Offices.

d. Deputy Assistant Secretary for Military Application and Stockpile Management (DP-20).

- (1) Serves as the focal point for the Department's dual-agency responsibility with the DoD for nuclear weapon surety.

- (2) Develops DOE NEWS Program directives.
- (3) Provides overall DOE NEWS Program management and direction including implementing surety policy and developing surety directives.
- (4) Ensures that there is an active and continuous review of the nuclear stockpile to identify surety concerns and a program to provide for stockpile improvements or positive measures to address identified concerns.
- (5) Ensures that all surety actions related to nuclear weapons requiring a DOE concurrence to the DoD are thoroughly analyzed from a surety viewpoint by qualified experts.
- (6) Conducts appraisals of Operations Offices to evaluate their implementation of the DOE NEWS Program.
- (7) Coordinates nuclear explosive safety, security, and use control policies to ensure balance and consistency with the nuclear explosive surety standards.
- (8) Develops, implements, and maintains a DP-20 quality assurance (QA) program and approves Operations Office QA program and implementation plans that shall include nuclear explosive operations in accordance with DOE 5700.6C.

e. Director, Office of Security Affairs (NN-50).

- (1) Establishes safeguards and security directives for nuclear explosives, nuclear components, and special nuclear assemblies.
- (2) Advises DP-1 as to the adequacy of DOE and DOE contractor safeguards and security programs.

f. Managers of Operations Offices are responsible to DP-20 to perform the following.

- (1) Implement the provisions of this and related Orders.
- (2) Ensure that DOE NEWS Program responsibilities, as appropriate, are assigned to Operations Office organizations, laboratories, contractors, and subcontractors.
- (3) Ensure that management and staff have full access and free communication with the Operations Office manager on NEWS matters.
- (4) Develop and publish field directives to implement this and related Orders.

- (5) Conduct operational aspects of the DOE NEWS Program for onsite transportation activities.
 - (6) Ensure surety of nuclear explosives during nuclear explosive operations.
 - (7) Develop, implement, and maintain an Operations Office QA program in accordance with DOE 5700.6C, and approve contractor QA program and implementation plans that shall include nuclear explosive operations in accordance with the requirements of DOE O 452.2A.
 - (8) Conduct appraisals of Area Offices and contractors to evaluate implementation of the DOE NEWS Program.
 - (9) Certify that all nuclear explosive surety standards are met.
- g. Manager, Albuquerque Operations Office, in addition to the responsibilities in paragraph 5f, above, is responsible to DP-20 to perform the following.
- (1) Conduct operational aspects of the DOE NEWS Program for offsite transportation activities.
 - (2) Administer DOE's participation in the DoD nuclear weapon system safety program and assist in the processing of DoD safety rules in accordance with DOE 5610.13.
 - (3) Conduct NEWS appraisals of the Transportation Safeguards Division.
- h. Manager, Nevada Operations Office, in addition to the responsibilities in paragraph 5f, above, is responsible to DP-20 for conducting operational aspects of the DOE NEWS Program and for the authorized detonation of test nuclear explosives.
- i. Design Laboratories and Production Agencies provide support to the DOE NEWS Program. This includes providing qualified personnel to support the NESSG and similar activities.

6. REFERENCES.

- a. DOE O 151.1, COMPREHENSIVE EMERGENCY MANAGEMENT SYSTEM, dated 9-25-95.
- b. DOE O 452.2A, SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS, dated 1-17-97.
- c. DOE O 470.1, SAFEGUARDS AND SECURITY PROGRAM, dated 9-28-95.

- d. DOE 5610.12, PACKAGING AND OFFSITE TRANSPORTATION OF NUCLEAR COMPONENTS, AND SPECIAL ASSEMBLIES ASSOCIATED WITH THE NUCLEAR EXPLOSIVES, dated 7-26-94.
 - e. DOE 5610.13, JOINT DEPARTMENT OF ENERGY/DEPARTMENT OF DEFENSE NUCLEAR WEAPON SYSTEM SAFETY, SECURITY, AND CONTROL ACTIVITIES, dated 10-10-90.
 - f. DOE 5610.14, TRANSPORTATION SAFEGUARDS SYSTEM PROGRAM OPERATIONS, dated 5-12-93.
 - g. DOE 5630.12A, SAFEGUARDS AND SECURITY INSPECTION AND ASSESSMENT PROGRAM, dated 6-23-92.
 - h. DOE 5700.6C, QUALITY ASSURANCE, dated 8-21-91.
 - i. DOE P 450.4, SAFETY MANAGEMENT SYSTEM POLICY, dated 10-15-96.
 - j. ASME NQA-1-1994, Quality Assurance Requirements for Nuclear Facility Applications, dated 1994.
 - k. Atomic Energy Act of 1954, as amended.
 - l. Executive Order 2.
 - m. National Security Decision Directive 281.
 - n. National Security Decision Directive 309, Safety, Security and Control.
 - o. "An Agreement Between the AEC and the DoD for the Development, Production, and Standardization of Atomic Weapons," dated 3-21-53.
 - p. "Memorandum of Understanding Between the DoD and the DOE on Objectives and Responsibilities for Joint Nuclear Weapon Activities," dated 1-17-83.
7. CONTACT. DP-20, Office of Weapons Surety (DP-21), 301-903-3463.

BY ORDER OF THE SECRETARY OF ENERGY:



ARCHER L. DURHAM
Assistant Secretary for
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DEFINITIONS

This attachment provides definitions pertinent to DOE O 452.1A.

1. Abnormal Environment. In DOE operations, abnormal environment means an environment that is not expected to occur during nuclear explosive operations and associated activities.

In DoD operations, abnormal environments are defined in a weapon's stockpile-to-target-sequence and military characteristics as those environments in which the weapon is not expected to retain full operational reliability.
2. Environment, Safety, and Health (ES&H). The application of risk reduction measures to control or mitigate the possibility of exposing the public, workers, and environment to hazardous materials or hazardous energy. This includes, for example, environmental protection, nuclear safety, criticality safety, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, industrial safety, and radioactive and hazardous waste management.
3. Fissile Material Dispersal. The aerosolization and transport of fissile material by a driving force, such as fire, high-explosive deflagration, or high-explosive detonation.
4. High-Explosive Deflagration. A rapid chemical reaction in which the output of heat is sufficient for the reaction to proceed and accelerate without input of heat from another source. Deflagration is a surface phenomenon, with the reaction products flowing away from the unreacted material along the surface at subsonic velocity.
5. High-Explosive Detonation. A violent chemical reaction within a chemical compound or mechanical mixture evolving heat and pressure. A detonation is a reaction that proceeds through the reacted material toward the unreacted material at a supersonic velocity.
6. Normal Environment. In DOE operations, normal environment means the environment in which nuclear explosive operations and associated activities are expected to be performed. In DoD operations, normal environment means the expected logistical and operational environments as defined in a weapon's stockpile-to-target-sequence and military characteristics that the weapon is required to survive without degradation in operational reliability.
7. Nuclear Detonation. An energy release through a nuclear process, during a period of time on the order of one microsecond, in an amount equivalent to the energy released by detonating four or more pounds of trinitrotoluene (TNT).
8. Nuclear Explosive. An assembly containing fissionable and/or fusionable materials and main charge high-explosive parts or propellants capable of producing a nuclear detonation (e.g., a nuclear weapon or test device).
9. Nuclear Explosive Area. An area that contains a nuclear explosive or collocated pit and main charge high-explosive parts.

10. Nuclear Explosive and Weapon Surety (NEWS) Program. The DOE NEWS Program was established to ensure adequate safety, security, and control of nuclear explosives and nuclear weapons.
11. Nuclear Explosive Operation. Any activity involving a nuclear explosive, including activities in which main charge high-explosive parts and pit are collocated.
12. Nuclear Explosive Operation-Associated Activities. Activities directly associated with a specific nuclear explosive operation, such as work on a bomb nose or tail subassembly, even when physically separated from the bomb's nuclear explosive subassembly.
13. Nuclear Explosive Safety (NES). The application of positive measures to control or mitigate the possibility of unintended or unauthorized nuclear detonation, high-explosive detonation or deflagration, or fire in a nuclear explosive area.
14. Nuclear Explosive Safety Study. A formal evaluation of the adequacy of positive measures to meet the DOE nuclear explosive Safety Standards.
15. Nuclear Weapon. A nuclear explosive configured for DoD use.
16. Nuclear Yield. The nuclear energy released in the detonation of a nuclear explosive, measured in terms of the weight of TNT required to produce the same amount of energy release.
17. Pit (Live). A fissile component, or set of fissile components, designed to fit in the central cavity of an implosion system and which if placed therein will create a nuclear explosive.
18. Positive Measures. Design features, safety rules, procedures, or other controls used individually or collectively to provide nuclear explosive surety. Positive measures are intended to ensure a safe response in applicable operations and be controllable. Some examples of positive measures are strong-link switches; other safety devices; administrative procedures and controls; general and specific nuclear explosive safety rules; design control of electrical equipment and mechanical tooling; and physical, electrical, and mechanical restraints incorporated in facilities and transport equipment.
19. Surety. Safety, security, and use control of nuclear explosives.
20. Use Control. The application of systems, devices, or procedures that allow timely authorized use of a nuclear explosive while precluding or delaying unauthorized use (nuclear detonation).